

General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.
- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.
- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.
- This document is paginated as submitted by the original source.
- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

7.9-10114
 LACIE-C00200^{TM-79978}
 VOLUME VI A (REV. A)
 JSC-09870

LARGE AREA CROP INVENTORY EXPERIMENT (LACIE)

Use available under NASA sponsorship
 of early and wide dis-
 tribution of Resources Survey
 data and without liability
 thereon.

N79-18382
 Unclassified
 G3/43 00114



NASA NOAA USDA

Level III Baseline

SYSTEM PERFORMANCE EVALUATION - EFFICIENCY ANALYSIS (SPE-EA) REQUIREMENTS

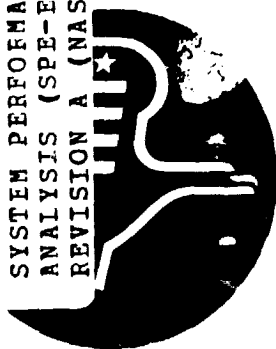
NOTICE: THIS IS A BASELINED LEVEL III DOCUMENT CON-
 TROLLED BY THE LACIE LEVEL III CHANGE CONTROL BOARD.
 ANY PROPOSED CHANGES SHOULD BE DOCUMENTED ON AN
 RECP FORM AND TRANSMITTED TO R. B. MACDONALD,
 LACIE MANAGER, NASA-JSC, CODE TF, HOUSTON, TEXAS 77058.

National Aeronautics and Space Administration
LYNDON B. JOHNSON SPACE CENTER

Houston, Texas

November, 1975

(E79-10114) LARGE AREA CROP INVENTORY
 EXPERIMENT (LACIE). LEVEL 3 BASELINE:
 SYSTEM PERFORMANCE EVALUATION, EFFICIENCY
 ANALYSIS (SPE-EA) REQUIREMENTS, VOLUME 6A,
 REVISION A (NASA) 28 P HC A03/MF A01



REVISIONS

REV LTR	CHANGE NO.	DESCRIPTION	DATE
A	5M0045	<p>BASELINE ISSUE (Reference CCBD #III-0001, dtd December 16, 1974)*</p> <p>Major revision due to rescope effort</p> <p>*The changes required by the following RID's which were approved during the LACIE Project Review conducted December 3 through 5, 1974, have been incorporated into this baseline issue of the LACIE Level III Requirements Documents:</p> <p>0-2 through 0-13, 0-15 through 0-29, and 0-31 through 0-46 1a-1, 1a-2, 1a-10,, 1a-21, 1a-34, and 1a-36 1b-3 and 1b-6 1c-2, 1c-4, 1c-5, 1c-9, 1c-10, 1c-13, 1c-16, 1c-17, and 1c-20 2-12a, 2-13, 2-17, and 2-27</p> <p>All other changes required by the remaining RID's approved during the Project Review will be incorporated by transmitting an RECP to the LACIE Level III Change Control Board for approval. Each RECP should be accompanied by the appropriate RID Closeout Form as described during the Project Review.</p>	<p>12-16-74</p> <p>11-4-75</p>

LIST OF EFFECTIVE PAGES

The current status of all pages in this document is as shown below:

<u>Page No.</u>	<u>Change No.</u>	<u>CCBD No.</u>
<u>ii</u> through <u>ix</u>	Original	5M0045
<u>1-1</u> through <u>11-1</u>	Original	5M0045

FOREWORD

Efficient management of the Large Area Crop Inventory Experiment (LACIE) dictates that effective controls of project activities be established. To provide a basis for effective control, documentation will be prepared, baselines will be established, and changes to the baseline will be subsequently controlled by the proper management levels.

The specific control documents that will be used are defined in the LACIE Project Plan, LACIE-C00605. All elements of the LACIE project must adhere to these baselined control documents; and, where it is considered that the requirements should be changed, the proper change request, accompanied by a full justification, must be submitted to the proper management level in accordance with established procedures. These documents will be maintained current by change notices and revisions, as required. Each change notice and/or revision will reference the applicable Change Control Board Directive (CCBD) which approved the change.

This document, LACIE-C00200, Volume VI-A (Revision A), defines the LACIE System Performance Evaluation - Efficiency Analysis (SPE-EA) requirements and has been prepared in accordance with the Instructions for Preparation of LACIE Requirements Documents, LACIE-00100, Revision C, Dated November 20, 1974. "Full-Up System," as used in this document, is defined as the system required to accomplish LACIE Phase II. In general, the approach used in each section is to first specify the requirements of the Full-Up System and then to specify the requirements of any interim systems by reference to specific paragraphs in the Full-Up System requirements sections of the document. The LACIE project phases are defined in the LACIE Project Plan, LACIE-C00605.

The organization responsible for the implementation of each requirement defined in

this document is specified on an individual requirement basis. Where the implementation responsibility applies to the complete section, the implementation responsibility is specified after the section title. A "section" for the purposes of designating implementation responsibility is defined as being any numbered paragraph and all subparagraphs. Where different implementation responsibilities apply to different portions of a section, the implementation responsibility is specified on an individual paragraph or sentence basis, as applicable. All implementing organizations designated shall accomplish their implementation activities in accordance with the requirements specified herein.



R. B. Mac Donald



R. B. Mac Donald
Manager, Large Area Crop Inventory Experiment

OF
OF
CONTENTS

Section		Page
1.0	<u>FUNCTIONAL RESPONSIBILITIES</u>	1-1
1.1	GENERAL	1-1
1.2	SPECIFIC	1-1
2.0	<u>APPLICABLE DOCUMENTS</u>	2-1
3.0	<u>FUNCTIONAL FLOW DIAGRAMS</u>	3-1
3.1	DEVELOPMENT	3-1
3.1.1	<u>Full-Up System</u>	3-1
3.1.2	<u>Interim Systems</u>	3-1
3.2	OPERATION	3-1
3.2.1	<u>Full-Up System</u>	3-1
3.2.2	<u>Interim System</u>	3-1
4.0	<u>REQUIREMENTS (CONSOLIDATED)</u>	4-1
4.1	FULL-UP SYSTEM	4-1
4.1.1	<u>Approach</u>	4-1
4.1.2	<u>Requirements</u>	4-2
4.2	INTERIM SYSTEM	4-4
5.0	<u>INPUT REQUIREMENTS</u>	5-1
5.1	FULL-UP SYSTEM	5-1
5.1.1	<u>Data Requirements for the Data Acquisition, Preprocessing, and Transmission Subsystem (DAPTS)</u>	5-1
5.1.2	<u>Classification and Mensuration Subsystem (CAMS)</u>	5-2
5.1.3	<u>Yield Estimation Subsystem (YES)</u>	5-2
5.1.4	<u>Crop Assessment Subsystem (CAS)</u>	5-2
5.1.5	<u>ISRRS</u>	5-2
5.1.6	<u>System Performance Evaluation (SPE)</u>	5-2
5.1.7	<u>Information Evaluation (IE)</u>	5-2
5.1.8	<u>Research</u>	5-2
5.1.9	<u>Test and Evaluation</u>	5-3
5.2	INTERIM SYSTEMS	5-3
6.0	<u>OUTPUT REQUIREMENTS</u>	6-1
6.1	FULL-UP SYSTEM	6-1
6.1.1	<u>Weekly System Efficiency Summary</u>	6-1
6.1.2	<u>Monthly SPE Report</u>	6-1
6.1.3	<u>System Simulation Analysis</u>	6-1
6.2	INTERIM SYSTEM	6-2
7.0	<u>INTERFACE REQUIREMENTS</u>	7-1
8.0	<u>OPERATIONAL REQUIREMENTS AFFECTING THE DESIGN</u>	8-1
8.1	THROUGHPUT REQUIREMENTS	8-1
8.2	RESPONSE REQUIREMENTS	8-1
8.3	RELIABILITY REQUIREMENTS	8-1
8.4	SECURITY REQUIREMENTS	8-1

Section		Page
8.5	DELIVERY REQUIREMENTS	8-1
8.6	QUALITY CONTROL REQUIREMENTS	8-1
8.6.1	<u>Quality Control of SPE-EA Data</u>	8-1
8.7	OTHER OPERATIONAL REQUIREMENTS	8-1
9.0	<u>SUBSYSTEM VERIFICATION REQUIREMENTS</u>	9-1
10.0	<u>RESEARCH REQUIREMENTS</u>	10-1
10.1	RESEARCH SUPPORT	10-1
11.0	<u>TEST AND EVALUATION REQUIREMENTS</u>	11-1

GLOSSARY

ADP	Automatic Data Processing
AI	Analyst Interpreter
ASVB	Applications System Verification Branch
CAMS	Classification and Mensuration Subsystem
CAS	Crop Assessment Subsystem
CCBD	Change Control Board Directive
COD	Center Operations Directorate
CPU	Central Processing Unit
DAPTS	Data Acquisition, Preprocessing, and Transmission Subsystem
DPCA	Data Production Control Analyst
DSAD	Data Systems and Analysis Directorate
EOD	Earth Observations Division
FSO	Facilities Support Office
Full-Up System	System required to accomplish Phase II of LACIE
GPSS	General Purpose Systems Simulator
GSFC	Goddard Space Flight Center
IBM	International Business Machines
IE	Information Evaluation
IMS	Information Management Subsystem
Interim Systems	Systems required to accomplish subphases of LACIE Phase I excluding LACIE subphases IA and IB
I/O	Input/Output

ISRRS	Information Storage, Retrieval, and Reformatting Subsystem
JSC	Lyndon B. Johnson Space Center
LACIE	Large Area Crop Inventory Experiment
LACIE PO	LACIE Project Office
Landsat	Land Satellite
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
OCC	Operations Control Center
PFC	Production Film Converter
QA/QC	Quality Assurance/Quality Control
PTEB	Research, Test, and Evaluation Branch
SEAD	Science and Applications Directorate
SMF	System Management Facility
SPE-EA	System Performance Evaluation - Efficiency Analysis
TBD	To Be Determined
USDA	U.S. Department of Agriculture
YES	Yield Estimate Subsystem

SECTION 1.0
FUNCTIONAL RESPONSIBILITIES

1.1

GENERAL

The SPE-EA is responsible for analyzing the LACIE system to evaluate its efficiency, to evaluate the impact of proposed changes to the system, and to make work-around recommendations for encountered problems. The SPE-EA will support the design and operation of the LACIE system and provide the mechanism for trade-off analysis in support of transferring the system to other operational environments.

1.2

SPECIFIC

The specific responsibilities of the SPE-EA include the definition, development, implementation, and operation of the programs and/or procedures necessary for the analysis of system information to provide a timely performance evaluation of the resources utilized in LACIE. Resource parameters and the quantity of data processed by each system component for the corresponding period will be input into a system simulation model that will provide the mechanism to interrelate the various functions in the system. The analysis of these resource data will provide an estimate of the efficiency performance of the system and its components for operations analysis and will provide a means by which change impact studies or work-around recommendations can be made.

SECTION 2.0
APPLICABLE DOCUMENTS

The following documents are applicable to the extent specified herein:

- A. LACIE Project Plan, LACIE-C00605, August 1975.
- B. Instructions for Preparation of LACIE Requirements Documents; LACIE-00100, Revision C, November 20, 1974.

PRECEDING PAGE BLANK NOT FILLED

SECTION 3.0
FUNCTIONAL FLOW DIAGRAMS

3.1 DEVELOPMENT

3.1.1 Full-Up System

The functional flow diagram for LACIE efficiency analysis development is presented in figure 3-1.

3.1.2 Interim Systems

Not applicable.

3.2 OPERATION

3.2.1 Full-Up System

The operational functional flow diagram for the efficiency analysis of the LACIE system is presented in figure 3-2.

3.2.2 Interim System

Not applicable.

PRECEDING PAGE BLANK - NOT REPRODUCED

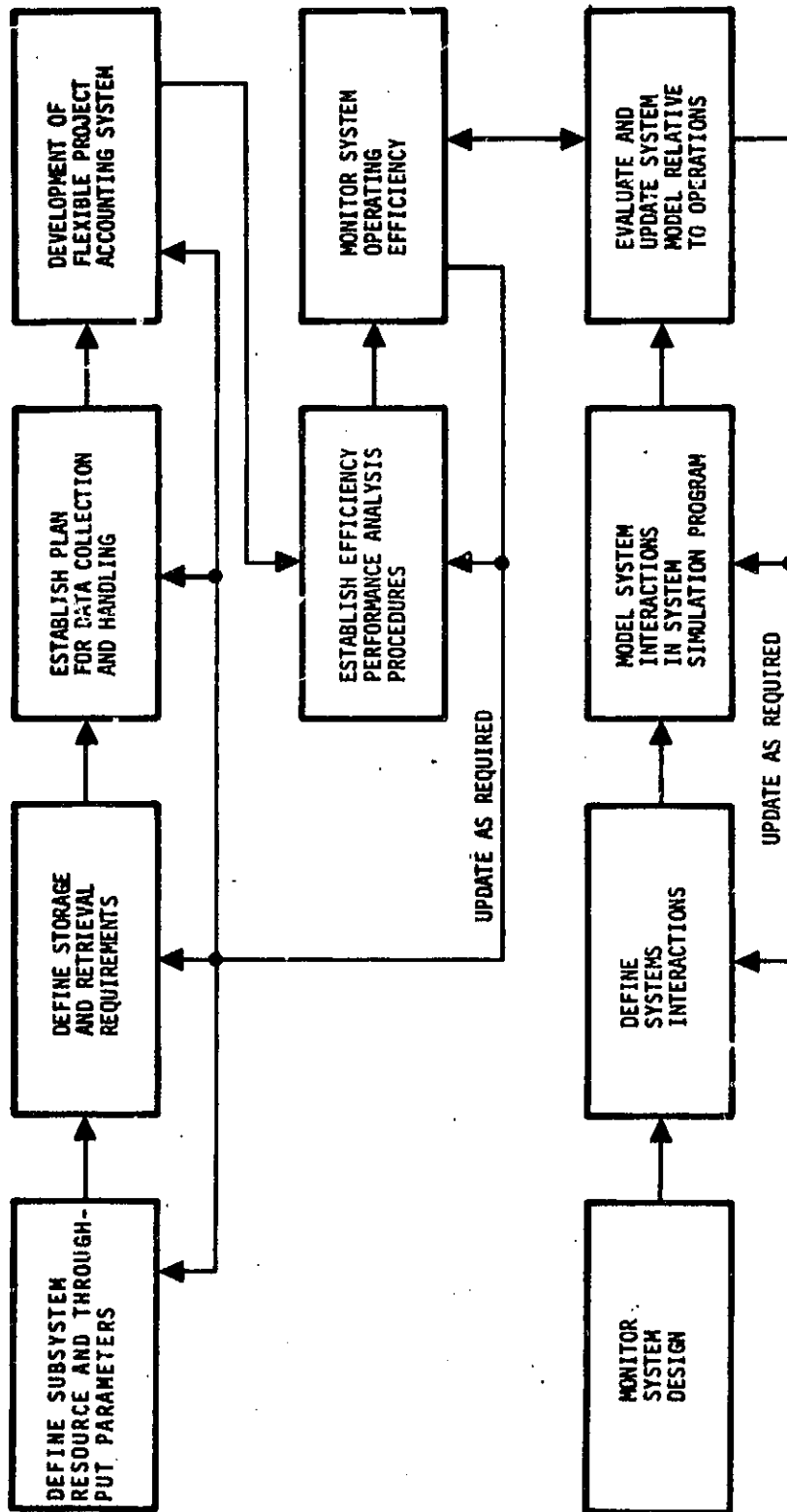


Figure 3-1.- Functional flow diagram for LACIE efficiency analysis development.

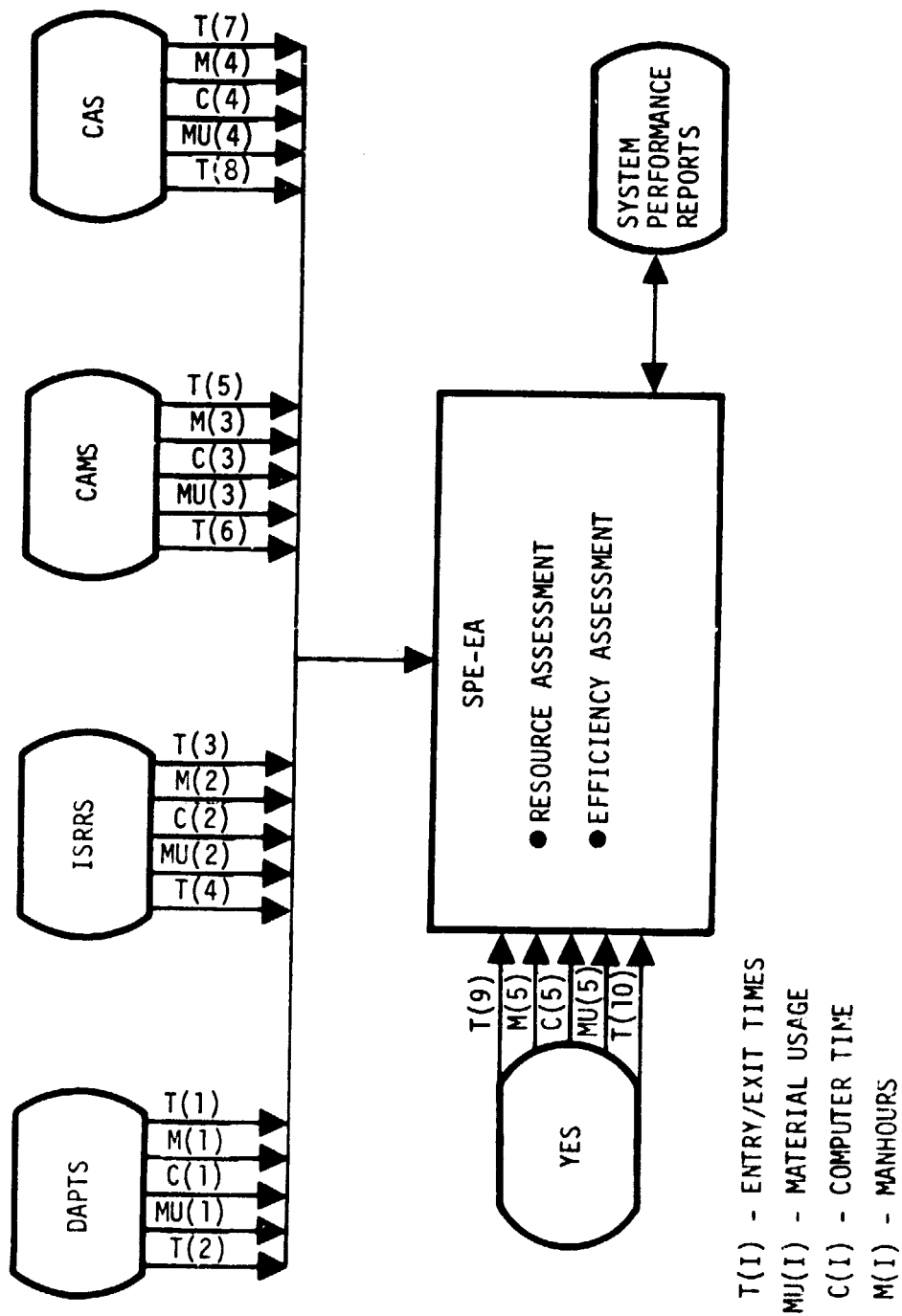


Figure 3-2.- Operational functional flow diagram.

SECTION 4.0
REQUIREMENTS (CONSOLIDATED)

4.1

PULL-UP SYSTEM

The SPE-EA will monitor the resource utilization and throughput information recorded by the various components of the LACIE operations (as differentiated from those associated with LACIE development). These data will be summarized periodically and provided to the system managers. The evaluation of these data will provide the necessary input parameters for a system simulation model which synthesizes system behavior. The model will be used with supportive operations data for timely analysis of system operating efficiency and for evaluation of proposed system modifications relative to their overall impact on the efficiency of the system. Recommendations will be made to the experiment managers as to the changes that would have the minimum impact and/or maximum efficiency.

4.1.1

Approach

The approach for the development and implementation of the SPE-EA is diagrammed in figure 3-1. The initial step in obtaining the data required for a system efficiency evaluation is to study the function and operation of each component of the system to identify the resource and throughput parameters to be monitored. These data will be monitored and collected periodically by the respective subsystem in a format that can be readily computerized (i.e., punched card format or magnetic tape). These data will provide the basic input information for system performance evaluation.

The system efficiency analysis will be performed to support two different aspects of the LACIE operation. The first aspect is the storage, retrieval, and cataloging of the efficiency parameters by use of conventional accounting programs modified relative to the LACIE system. The purpose of a project accounting program is to provide the system managers a weekly summary of their system

operating efficiency with enough flexibility in the retrieval and formatting of the information to meet each manager's particular needs. These types of accounting data will be used to support the routine LACIE operations, to provide visibility into the overall system performance, and to provide a means of documenting previous operations.

The second aspect of the LACIE operation to be supported by the resource data collected is the analysis of the impact of modifications to the operating system being contemplated. This analysis will be performed with the utilization of a system simulation model and supportive data. The system model will be developed with the General Purpose Systems Simulator (GPSS) language, using the baseline operating system as defined in the LACIE requirements document (LACIE-00200) and the nominal operating parameters of each system component. A recommended operational change to the LACIE system would be evaluated with the aid of the model and the resulting change in the efficiency of the system would be documented. If alternatives to the recommended change exist, these will be similarly evaluated and a recommendation made relative to the results of the efficiency analysis.

4.1.2 Requirements

4.1.2.1 General requirements.- The SPE will review the operating plan for each LACIE subsystem and identify the key parameters to be monitored, the frequency of reporting, and the format for reporting. In general, these data will consist of the resources (primarily composed of manpower, computer time, and materials) and the data processed. The equipment utilized will be documented to establish a correspondence with the resource parameters. The initial compilation of these parameters is given for each LACIE subsystem in section 5.1 of this document (Volume VI-A). The resources expended by the Goddard Space Flight Center of the National Aeronautics and Space Administration (GSPC/NASA) in the acquisition of satellite

data required by LACIE will not be routinely monitored by SPE. This information can be obtained through Goddard Space Flight Center (GSFC)/NASA.

- 4.1.2.2 Efficiency parameters (Req'd by SPE; Cat. 1; Impl. resp.: all subsystems).- Each of the LACIE subsystems will monitor and record on an as-requested basis the SPE inputs identified in section 5.1 (Volume VI-A) in the format indicated. This will include non-Lyndon B. Johnson Space Center (JSC) resources expended directly in support of LACIE operations and, in addition, those resources required to support LACIE at JSC.
- 4.1.2.3 Throughput parameters.- The throughput of the operational LACIE system will be monitored and recorded by the various data statusing functions in the LACIE systems. These data are required by the SPE in order to accomplish its resource utilization monitoring and system simulation. The following lists the specific data and reports required by SPE.
- 4.1.2.3.1 Data Systems and Analysis Directorate (DSAD) throughput status (Req'd by SPE-EA; Cat. 1; Impl. resp.: NASA-DSAD): The throughput status is as follows:
- A. A copy of the daily Data Production Control Analyst (DPCA) LACIE production schedule reports is required to be supplied to SPE-EA via the Earth Observations Division (EOD) Operations Control Center on a daily basis.
 - B. A copy of the LACIE GSFC Tape Status listing on a weekly basis.
- 4.1.2.4 Project accounting (Req'd by SPE-EA; Cat. 2; Impl. resp.: SPE-EA/LACIE Applications System Verification Branch (ASVB)).- The SPE will develop a project accounting system that will allow for an orderly, timely, and meaningful assimilation of the LACIE efficiency data. An accounting summary will be provided for each subsystem and for the overall system in summary form, compiled weekly and monthly (section 6.1

- Volume VI-A). These data will be available to system managers on request.

4.1.2.5 Simulation model (Req'd by SPE; Cat. 2: Impl. resp.: SPE-EA/LACIE ASVB).- The SPE will implement a model of the LACIE operating system by using the General Purpose Systems Simulator (GPSS). This model will contain descriptors representing each major component of the operating system (such as data throughput, manpower, computer materials, and equipment usage). These descriptors will be updated periodically to represent the current operating characteristics of LACIE.

4.1.2.6 Impact studies (Req'd by SPE; Cat. 1; Impl. resp.: SPE-EA/LACIE ASVB).- The SPE will evaluate the impact of a recommended change to the operating system. This will be initiated by a written request detailing the exact purpose, the nature of the change, the kind of recommendation, and the date required. This request must be approved by the ASVB manager.

4.2 INTERIM SYSTEM
Not applicable.

SECTION 5.0
INPUT REQUIREMENTS

Inputs required by SPE from the other LACIE functional elements are defined in the following paragraphs.

5.1 FULL-UP SYSTEM

5.1.1 Data Requirements for the Data Acquisition, Preprocessing, and Transmission Subsystem (DAPTS)

5.1.1.1 Landsat data requirements (Cat. 2; Impl. resp.: DAPTS).- The Landsat data requirements are as follows:

5.1.1.1.1 DAPTS/Landsat resource parameters: Monitor and record resource information on an as requested basis.

5.1.1.1.2 Weekly data status report (Cat. 2; Impl. resp.: DAPTS): Monitor and record on a weekly basis the following data acquisition information:

- A. The number of attempted sample segment acquisitions and the number acquired.
- B. The number of sample segments processed.
- C. The number of daily segment tapes sent to JSC/EOD in support of LACIE operations.
- D. The number of daily segment tapes reordered/ reprocessed.

This information is associated with the preprocessing and transmission of data from GSFC to JSC.

5.1.1.2 Field data requirements.- The field data requirements are as follows: The DAPTS/field resource parameters (Cat. 2; Impl. resp.: DAPTS) are to be monitored and recorded as requested.

5.1.1.3 Historical agricultural data requirements.- The historical agricultural data requirements are as follows: The DAPTS/ historical agricultural resource parameters (Cat. 2; Impl. resp.: DAPTS) are to be monitored and recorded as requested.

- 5.1.1.4 Real-time meteorological data requirements.-
The real-time meteorological data requirements are as follows: The DAPTS/ real-time meteorological resource parameters (Cat. 2; Impl. resp.: DAPTS) are to be monitored and recorded as requested.
- 5.1.1.5 Historical meteorological data requirements.-
The historical meteorological data requirements are as follows: The DAPTS/ historical meteorological resource parameters (Cat. 2; Impl. resp.: DAPTS) are to be monitored and recorded as requested.
- 5.1.2 Classification and Mensuration Subsystem (CAMS)
- 5.1.2.1 CAMS resource parameters (Cat. 2; Impl. resp.: CAMS).- Monitor and record throughput and resource information on an as requested basis.
- 5.1.3 Yield Estimation Subsystem (YES)
- 5.1.3.1 YES resource parameters (Cat. 2: Impl. resp.: YES).- Monitor and record throughput and resource information on an as requested basis.
- 5.1.4 Crop Assessment Subsystem (CAS)
- 5.1.4.1 CAS resource parameters (Cat. 2; Impl. resp.: Information Storage, Retrieval, and Reformatting Subsystem (ISRRS).- Monitor and record TBD throughput and resource information of CAS operations for a TBD period of time on an as requested basis.
- 5.1.5 ISRRS
- 5.1.5.1 ISRRS resource parameters (Cat. 2; Impl. resp.: ISRRS).- Monitor and record throughput and resource information on an as requested basis.
- 5.1.6 System Performance Evaluation (SPE)
Not applicable.
- 5.1.7 Information Evaluation (IE)
Not applicable.
- 5.1.8 Research

The reports required from Research are identified in section 10.1.

5.1.9 Test and Evaluation
Not applicable.

5.2 INTERIM SYSTEMS
Not applicable.

SECTION 6.0
OUTPUT REQUIREMENTS

Outputs from SPE which will be provided to the other LACIE functional elements are defined in the following paragraphs.

6.1 PULL-UP SYSTEM

6.1.1 Weekly System Efficiency Summary
(Req'd by LACIE-ASVB; Cat. 2; Impl. resp.:
SPE/LACIE-ASVB)

A weekly computer printout summarizing the data reported during the week will be produced. The summary printout will list the week's input, the average value, and the cumulative totals for each system component. This output will be available each Friday and will pertain to the information collected through the previous week. These data will be available to system managers, subsystem managers, and functional managers on request.

6.1.2 Monthly SPE Report
(Req'd by LACIE-ASVB and U.S. Department of Agriculture (USDA)/IE; Cat. 2; Impl. resp.:
SPE/LACIE-ASVB)

On the 15th of each month, a report on the system performance to date will be produced. This will include the data processed, and the throughput rate for the previous month and a comparison with the average and extreme values encountered prior to that month. TBD copies of the report will be made and distributed to system managers, subsystem managers, functional managers, in addition to a TBD distribution list.

6.1.3 System Simulation Analysis
(Req'd by LACIE-ASVB; Cat. 2; Impl. resp.:
SPE/LACIE-ASVB)

The system simulation model will be utilized in analyzing changes to the operating system being considered. An impact or sensitivity analysis will be made on the contemplated changes. The

results of this study and any recommendations
on this study will be reported as available.

6.2

INTERIM SYSTEM
Not applicable.

Not applicable.

SECTION 8.0
OPERATIONAL REQUIREMENTS AFFECTING THE DESIGN

8.1 THROUGHPUT REQUIREMENTS
Not applicable.

8.2 RESPONSE REQUIREMENTS
(Req'd by SPE; Cat. 1; Impl. resp.: SPE-
EA/NASA-DSAD)

Priority will be required for approximately
five Univac 1108 or 1110 computer jobs per
week. The aggregate time will not exceed 20
minutes per week.

8.3 RELIABILITY REQUIREMENTS
Not applicable.

8.4 SECURITY REQUIREMENTS
Not applicable.

8.5 DELIVERY REQUIREMENTS
Not applicable.

8.6 QUALITY CONTROL REQUIREMENTS

8.6.1 Quality Control of SPE-EA Data
(Req'd by SPE; Cat. 1; Impl. resp.: SPE-
EA/NASA-DSAD)

All keypunching of SPE data must be verified.
All regular SPE-EA reports will be provided to
the Quality Assurance/Quality Control (QA/QC)
manager. Verbal reports to the QA/QC manager
will be provided when potential or real problem
areas are recognized and an expeditious report
is required.

8.7 OTHER OPERATIONAL REQUIREMENTS
None identified.

SECTION 9.0
SUBSYSTEM VERIFICATION REQUIREMENTS

Each organization designated with implementation responsibility will prepare a LACIE Verification Plan, including a complete definition of the verification functions proposed for verification of the portion of LACIE for which they are responsible. Each organization will submit its plan for approval to the LACIE Level 3 Change Control Board within 90 days after the requirements documents are baselined.

2. LACIE BLANK /NOT PLAN/

SECTION 10.0
RESEARCH REQUIREMENTS

10.1

RESEARCH SUPPORT
(Req'd by SPE; Cat. 2; Impl. resp.:
Research/LACIE-Research, Test, and Evaluation
Branch (RTEB))

1 PAGE BLANK NOT FILLED

SECTION 11.0
TEST AND EVALUATION REQUIREMENTS

Not applicable.

RECEIVED PAGE BLANK NOT FILLED